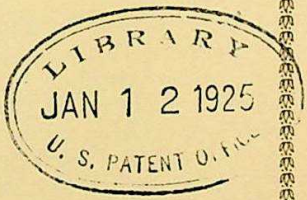
606/31

High Frequency Currents and Roentgenotherapy in Vesical Tumors

By

G. KOLISCHER, M. D., and H. KATZ, M. D., Chicago



Reprinted from *Fischer's Magazine*

FORM 490

606/31

High Frequency Currents and Roentgenotherapy in Vesical Tumors

GUSTAV KOLISCHER, M. D., and HARRY KATZ, M. D., Chicago

The introduction by Beer of the high frequency spark in the treatment of vesical tumors was an impetus to the study of satisfactory methods for controlling such growths. Endovesical and transvesical application of the high frequency current was taken up with great enthusiasm by urologists, so that at present these forms of treatment are considered by a majority as the method of choice in tumors of the urinary bladder. Clinical experience, together with the teachings of modern biology and pathology, have helpd to clear the field. In the application of high frequency currents one must distinguish between fulguration, the destruction of structures by the electric spark, and surgical diathermy, the killing of tissues without sparking by the heat produced through the resistance offered by the tissues to the current forced through them.

Fulguration may be applied by the endovesical route, the cystoscope with the attached carrying tube and active electrode being introduced through the urethra, while the inert electrode is placed on the back of the patient. The destruction of the tumor is accomplished without opening the viscus, the current used being of low voltage and amperage. This procedure is the method of choice in all presumably benign tumors whose location and size permit approach by the fulguration wire. Whether the spark is directed to the base or the crown of the growth will depend on the character of the papilloma. The quickest method of removing such an excrescence is to place the wire tip directly in the base of the tumor. Thus the nourishing blood vessels are rapidly obliterated. In consequence, the growth shrivels immediately and the whole operation is finished in one step.

This sort of fulguration is advantageously applicable only to the leaf-shaped papillomas that have a constricted pedicle and are so transparent that the blood vessels running through them are easily seen.

However, in papillomas that carry a dendritic, bushy crown, the direct approach to the base may not only be difficult but also disadvantageous for other reasons. Even if one succeeds in placing the end of the wire into the base, the crown of the tumor is likely to drop over it, making it impossible to watch the effect of the spark. Then the pushing around of the crown may lead to the separation of intact particles, thus leading to multiple implantation of such fragments, whose inclination toward proliferation may eventually lead to a papillomatosis of the entire bladder. In all such instances it is advisable to start the coagulation from the top of the growth, bringing the active electrode successively in contact with various sectors of the crown.

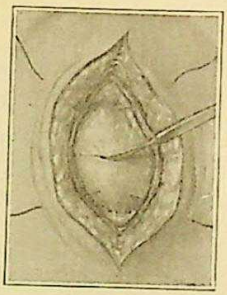


Fig. 1.—Bladder exposed; transverse incision placed between the two suspension sutures.

Even if particles of the tumor are dispersed throughout the cavity of the bladder, these fragments are readily devitalized by the spark and unable to form an implant. As a rule, in such cases it will be necessary to make several applications at various sittings; but this disadvantage is outweighed by the safety of the procedure.

Endovesical fulguration must not be attempted if circulatory changes are observed around the base of the papilloma, though in all other particulars this growth may show the clinical signs of benignancy. These changes may be edema, submucous blood patches, engored and numerous blood vessels, or simply thickening and rigidity of the adjacent mucosa, which in such

a case, as a rule, has lost its normal gloss. Then the application of the spark may involve pronounced danger. It must be remembered that the fulguration spark not only burns but also produces a mechanical effect, divulsing and comminuting the tissue it is brought to bear upon.

These circulatory disturbances may be due to inflamation subsequent to infection or to malignant degeneration in and around the base of the tumor. In either case fulguration may be followed by untoward results. Infectious matter may be forced into the surrounding tissues, and severe pericystitis and even peritonitis may develop; in the case of malignancy, forced dissemination of malignant cells may result, which quite often leads to an explosive luxuriation, so that in a short time the whole pelvis becomes filled with cancerous masses.

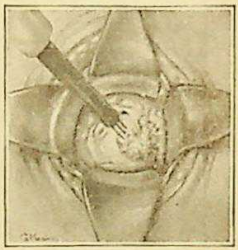


Fig. 2.—Carbonization of arboraceous crown of tumor with multispiked electrode.

In all cases of the character mentioned and in all decidely malignant instances, surgical diathermy, after the bladder has been opened, should be employed; that is, currents of higher tension and voltage are used. The details of administering the high frequency current will again be regulated by the features peculiar to the tumor under consideration. The leading requirements are simplification of the entire procedure, avoidance of implantation of tumor particles likely to luxuriate in the adjacent areas, and the delivery of a finished surgical product, thus making possible an early resumption of the natural functions and shortening the time of recovery, and at the same time satisfying the principle postulate, the avoidance of a relapse of malignancy.

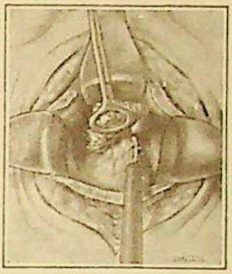


Fig. 3.—Elevation of tumor crown; severing of the pedicle by the galvanocautery.

We apply in vesical tumors solely the monopolar method. The inert electrode, a square of block tin, 20 by 10 cm., padded with gauze soaked in physiologic sodium chlorid solution, is placed under the hips of the patient, while the coagulation is carried out by a metalic electrode introduced into the opened bladder. Into the rectum a Barnes bag is inserted, and this is distended by 200 c.c. of water, raising the trigon and facilitating the clearance of the vesical base. The bladder is distended with 200 c.c. of a 2 per cent protargol solution. By the usual median abdominal incision, the anterior aspect of the bladder is exposed, and the reduplication of the peritoneum is stripped off by gauze dissection, exposing freely the outer anterior bladder wall. Then in the upper and lower angle of the wound two tension sutures are inserted which penetrate the bladder wall. The ends of the suture are secured by metal clasps, the weight of which helps to elevate the bladder, which in later stages makes the vesical cavity better accessible. Now the bladder is opened between these guy ropes by a transverse incision (Fig. 1). The transverse incision, while permitting free exposure of the vesical interior, offers the advantage of facilitating the suturing of the bladder wound and at the same time prevents oozing of urine into the cavum retzii, in case the suture line should give. Then in the upper and lower angle of the vesical incision a fibre retractor is inserted. As a rule,

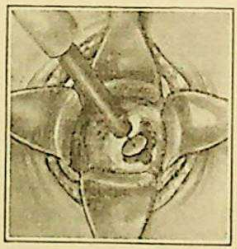


Fig. 4.—Coagulation of tumor base and concomitant sealing of adjacent lymphatics with the stamp-shaped electrode.

pulling in an occipitocaudal direction will suffice to give sufficient clearance; in the case of very large tumors, one or two lateral retractors may have to be added. If one encounters an arboraceous bushy tumor, an electrode carrying three or four spikes is chosen (Fig. 2); and , by raining a shower of heavy sparks all over the crown of the tumor, a superficial coagulation or carbonization is accomplished. This deals successfully with any hemorrhage present, prevents bleeding during the following steps, and at the same time does away with the danger of implantation, because even if tumor particles are broken off during the necessary manipulations, these crumbs are already devitalized. If the tumor is pedunculated, its seared top is seized with forceps and gently pulled upward. The exposed pedicle is now severed with a galvanocautery closely to its implantation (Fig. 3). The resulting stump and the immediately adjacent area are now coagulated with a stamp-shaped electrode to the desired depth (Fig. 4). If the tumor is dentritic, but rather sessile without a well defined pedicle, then the initial act of sparking is executed by means of a single spiked electrode. The sparks of this cover a lesser area than the multispiked one, but produce deeper penetration, so that the whole tumor mass is quickly reduced to a hard crust (incineration). This procedure is more in the nature of the original sideration. Then, the stamp-shaped electrode is applied again for the coagulation of the base, care being taken to include the whole visible and palpable area of malignant infiltration in the coagulation. The sideration and coagulation are carried on until a thoroughly dry scab results and no punctate oozing is to be seen. The scab is as a rule white, unless the tumor is very rich in blood, when it is black. Under no condition is the spike pushed into the tumor mass, for reasons explained above. Sessile infiltrating tumors are coagulated immediately with the stamp electrode without any previous sparking.

The extent of the coagulation and to what depth it ought to be carried out deserve some discussion. At first it was deemed necessary to coagulate the entire tumor mass in dealing with malignant growths. But experience covering immediate and remote results in bladder tumors and uterine cancers led to restrictions which, if applied, apparently improve the results in a striking way. If, for instance, a tumor, whether an indigenous vesical growth or a prostatic cancer that perforated into the bladder, involves the vesicorectal septum, a complete coagulation of this mass will produce a cloaca after the sloughing is finished. In addition to the distress caused to the patient, such a condition will almost invariably lead to general sepsis or to death by the development of a septic pyonephrosis. Therefore, in cases of this type the coagulation should penetrate the tumor only to a limited depth, while the remainder of it is left to the influence of roentgenotherapy.

Fig. 5. — Vesical incision closed by a mattress suture.

In case the latter should be successful, then the part of the tumor that replaced to a certain extent the septum will in course of time be replaced by fibrous tissue, thus avoiding the formation of a cloaca. This procedure, originally instituted as the choice of the lesser evil, became under the weight of further experience the routine method. It was observed that roentgenotherapy following partial electrocoagulation yielded curative results that, in our experience, surpassed those previously accomplished by the employment of one of these methods alone. After the necessary electrocoagulation is completed, the bladder is mopped clean, care being taken to do all the sponging

by dabbing and not by wiping, thus avoiding traumatism to the vulnerable vesical mucosa. Then the incision in the bladder is closed by catgut sutures inserted in such a way as to guarantee a broad apposition and avoidance of impaction of the mucosa into the suture line (Fig. 5). Over this suture a simple running suture is whipped to insure water tightness. Then the tension sutures supporting the abdominal wall are placed. Underneath these sutures a fine drainage tube, preferably a silver one, is placed, parallel to the incision and protruding at each end of it (Fig. 6). In this way perfect drainage is insured, and even in case of infection, sloughing of the fascia is prevented. Then fascia and cutis are closed in the usual way, and the guy ropes are tied.

The patient either begins to urinate naturally shortly after the operation, or, if unable to do so, is catheterized at regular intervals until the natural function is resumed. As a rule, the whole wound heals by first intention, and even if a slight breaking down should occur, the repair sets in quickly.

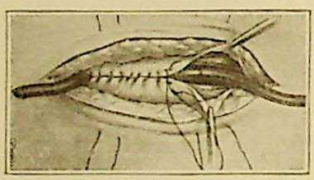


Fig. 6.—Drainage tube inserted underneath tension and suspension sutures; the fascia is closed over it.

The sloughing away of the diathermic scab takes from ten to sixteen days, according to the extent of the electrocoagulation obtained. On account of the varying intensity of the desiccation in the various sectors of the area subjected to diathermy, and the timely difference in the subsequently developing demarcating inflammation, the sloughing proceeds in the various areas with varying velocity. Therefore there are never large chunks of scabs thrown off at once, and the loosened shreds are further softened by the urine, and the sloughed particles are voided with the urinary stream. Beginning at the end

of the first week after the operation as a matter of extreme precaution the bladder is regularly flushed with an antiseptic solution.

THEORETICAL CONSIDERATION

In explanation, the following theory may be offered: It is shown that, subsequent to electrocoagulation around the necrosed area, there is created a zone of reaction, or aseptic inflammation; there is not only an invasion of highly active cells, as round cells and lymphocytes, but the fibrous tissue becomes abundantly vascularized and fibroblasts appear. It may be safely assumed that intact cancer cells existing within this zone also fall under this influence. All roentgenologists agree that the more hypermic a structure is and the more it returns to the juvenile stage, the better is the prognosis for the curative effect of the therapeutic rays. It may be suggested that under the action of the rays these energized cells produce materials which, in turn, act systematically to reduce the excessive multiplication of malignant cells. It therefore became our routine to coagulate malignant tumors to a restricted depth only, and to leave the remainder to roentgenotherapy.

CLINICAL EXPERIENCE

Out of twenty-seven cases of malignancy treated in the manner described two patients died: A woman died three days after the operation, with the symptoms of protein poisoning, evidently due to insufficient sealing of the lymphatics, permitting rapid absorption of débris; a man succumbed to a gas-producing bacillus infection in the abdominal wound, which became evident on the fourth day after the operation.

All the other patients, the oldest one being operated on

more than three years ago, do not show any relapse or malignancy at the present date.

The exposure, opening and closing of the bladder, may be done under local anesthesia; for the coagulation, general anesthesia is preferable; the short duration of this manipulation reduces materially the danger of general anesthesia.

SUMMARY

It should be mentioned that any extensive electrocoagulation is, as a rule, followed by the development of a more or less intensive edema of the vesical mucosa. If of a high degree, it may be and actually has been mistaken by the inexperienced for a relapse. Careful and repeated cystoscopic examinations will clear the issue. Roentgenotherapy in massive doses is administered forty-eight hours after the operation, thus taking advantage of the perithermic reaction. Preoperative irradiation interferes with the reconstructive potencies of the tissues and prevents primary reunion. We have not seen any favorable results from the employment of radium needles, but frequently infection following their use has been observed.

The whole procedure is simple, practically bloodless, and of short duration. The primary mortality is considerably lower than that following resections or total extirpations of the bladder. The destruction of the tumor does not involve any reduction of the capacity of the bladder, which is one of the objectionable features of the cutting operation. The patient is not subjected to the dangers and misery of an abdominal drainage.

108 North State Street.